

Supplementary table T1. Summary of predictors evaluated in new lesion appearance and OS models.

| Predictor | Description |
|---|--|
| I. Baseline characteristics | |
| Age | Older patients might be related poorer prognosis |
| Baseline SLD | Higher baseline tumor burden may relate to a shorter survival |
| Total number of lesions (≥ 3) | A larger number of lesions and organs involved may be associated with poorer prognosis |
| Number of metastatic sites ≥ 2) | |
| Presence of liver lesions | Presence of lesions in specific organs may be predictive of new lesions or worsening of the status |
| Presence of lung lesions | |
| Presence of lymph node lesions | |
| Presence of breast lesions | |
| II. SLD based characteristics | |
| SLD time course (SLDt) (log-transformed) | Increase in SLD indicates an increase in tumor burden and relate to shorter OS |
| Tumor size ratio at w9 | An early increase in tumor size (after 3 cycles) might be predictive of shorter OS |
| Relative change from baseline(t) | Increase in tumor burden could be related to shorter OS |
| Time to growth (TTG) | Longer time to growth is associated with better prognosis |
| Instantaneous change in SLD | First derivate of SLD time course |
| III. Lesion characteristics | |
| Largest lesion at baseline (LD1 ₀) | |
| Largest lesion time course (LD1t) | |
| Tumor size ratio w9 | |
| Relative change in largest lesion from LD1 ₀ | |
| Time to growth (TTG) | |
| Largest instantaneous change in any lesion [#] | |
| Sum of liver lesions [#] | Dynamics of liver lesions (LD1 _{liver} +LD2 _{liver}) |
| Sum of lymph node lesions [#] | Dynamics of liver lesions (LD1 _{lymph_nodes} +LD2 _{lymph_nodes}) |
| Sum of lung lesions [#] | Dynamics of liver lesions (LD1 _{lung} +LD2 _{lung}) |

[#] tested only in OS models

Supplementary table T2. Parameter estimates and their uncertainty in the final overall survival model.

| Parameter | Description (unit) | Typical value (RSE#) |
|-----------------------|--|----------------------|
| λ_{OS} | Intercept parameter of the Weibull function | 1.55 (49) |
| α_{OS} | Shape parameter of the Weibull function | 0.993 (17) |
| β_{New_lesion} | coefficient of the effect of appearance of new lesions on OS | 0.927 (27) |
| β_{TTG} | coefficient of the effect of time to growth on OS | -0.0134 (36) |
| $\beta_{TS(t)_SLD}$ | coefficient of the effect of the time course of SLD on OS | 0.311 (40) |

obtained from Sampling Importance Resampling (SIR)